This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-027249
(43)Date of publication of application : 05.02.1993

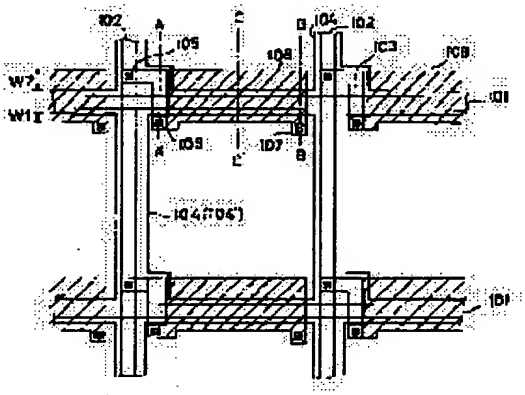
(51)Int.Cl. G02F 1/1343
G02F 1/133
G02F 1/136
G09G 3/36
H01L 27/12
H01L 29/784

(21)Application number : 03-186618
(22)Date of filing : 25.07.1991

(71)Applicant : SHARP CORP
(72)Inventor : SHIMADA NAOYUKI
ICHIMURA SACHIKO
YOSHIMURA YOJI

(54) ACTIVE MATRIX SUBSTRATE

(57)Abstract:
PURPOSE: To make an excellent display by suppressing the disordering of liquid crystal caused by signals sent through electric conductors on the active matrix substrate and to increase the numerical aperture of a light shield film.
CONSTITUTION: A shield film 108 provided above a gate bus line 101 is connected in a superposed state to one picture element electrode 104' between two picture element electrodes 104 and 104' which adjoin to each other across the gate bus line 101, even if liquid crystal is arranged on the picture element electrode 104' connected to the shield film 108, the picture element electrode 104' and shield film 108 are electrically connected and held at the same potential, so that the liquid crystal part can be prevented from being disordered. Further, part of the shield film 108 is superposed upon the other picture element electrode 104 between the two picture element electrodes 104 and 104', so even if the liquid crystal is arranged on the other picture element electrode 104 which is not at the same potential and the liquid crystal part is disordered, it can be covered with the shield film 108.



LEGAL STATUS

[Date of request for examination] 07.07.1995
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number] 2702319
[Date of registration] 03.10.1997

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2000 Japan Patent Office

CLAIMS

[Claim(s)]

[Claim 1] The electrochromatic-display display panel characterized by to consider as the composition from which it has the switching element and the pixel electrode which are formed in one substrate inside by the thin film, and electric-supply wiring, it has the light filter which has the irregularity of 0.3 micrometers or more in the substrate inside of another side, and a black mask, and it is constituted by preparing a liquid-crystal layer between them, and the length of the lap section of the aforementioned light filter and the aforementioned black mask differs by either the upper and lower sides or the longitudinal direction at least for two or more pixels of

[Claim 2] The electrochromatic display display panel according to claim 1 characterized by considering as the portion to which the thickness of a substrate which has a switching element becomes the thickest, and the composition which the light-filter section by the side of another substrate counters mutually in the black stripe section.

[Claim 3] The electrochromatic display display panel according to claim 2 characterized by considering as the composition which it has the storage capacitance connected to the switching element, the pixel electrode, and the pixel electrode in one substrate inside, and the light-filter section by the side of the aforementioned storage-capacitance portion and another substrate counters inside mutually.

[Claim 4] The electrochromatic display display panel according to claim 3 characterized by for a pixel being a delta array and the flat-surface configuration of a light filter being a dot-like.

[Claim 5] It is the active-matrix type electrochromatic display display panel to which the orientation of the liquid crystal is made to carry out in the predetermined direction by forming an orientation film in a two substrates inside front face, and grinding a rubbing cloth. As opposed to the portion which grinds in the convex configuration section by the side of the substrate which has a switching element at the time of rubbing, and becomes lowering The light filter of another substrate and the length of the lap section of a black mask which counter The electrochromatic display display panel according to claim 1 characterized by considering as the composition made longer than the length of the lap section of the light filter which counters the portion which grinds in the aforementioned convex configuration at the time of the aforementioned rubbing, and becomes raising, and a black mask.

[Claim 6] The electrochromatic display display panel according to claim 5 characterized by setting to 10

micrometers or more the light filter of another substrate and the length of the lap section of a black mask which counter to the portion which grinds in the convex configuration section by the side of the substrate which has a switching element at the time of rubbing, and becomes lowering.

[Claim 7] The electrochromatic display display panel according to claim 1 characterized by having a photograph patterning type light filter in one substrate inside, and not preparing the overcoat layer for flattening

---

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to a highly efficient active-matrix type electrochromatic display display panel.

[0002]

[Description of the Prior Art] In recent years, an active-matrix type electrochromatic display panel is beginning to be briskly used for a carried type personal computer, carried type television, video, etc., and the further big need will be expected from now on corresponding to multimedia-izing etc. Then, it is indispensable that a quality panel produces with the sufficient yield easily.

[0003] Some cross sections of the common active-matrix type electrochromatic display panel which the pixel of many [comparatively] red copper rust on the panel of a low resolution arranges in the shape of a delta are shown in drawing 6 .

[0004] The film surface was carried out inside, opposite arrangement of the array substrate 6 equipped with the switching element 1 formed by the thin film, the pixel electrode 2, a storage capacitance 3, the electric supply wiring 4, and the layer insulation film 5, and the black mask 7, the light filter 8 of red copper rust 3 color and the opposite substrate 10 equipped with the common electrode 9 was carried out through the about 5-micrometer spacer 11 in between, and liquid crystal 12 is enclosed between them. In addition, the orientation films 13, such as a polyimide, are applied to the inside front face of the aforementioned array substrate 6 and the opposite substrate 10, and orientation processing is further made in the predetermined direction by the rubbing method in the front face. 14 is a polarizing plate.

[0005] Moreover, some plans are shown in drawing 7 . In a general normally white mode, although the opening pattern of the black mask 7 on the opposite substrate 10 is determined corresponding to the pixel electrode 2 on the array substrate 6, since portions other than pixel electrode 2 shine and serve as leakage, from the pixel electrode 2, the opening range of the aforementioned

black mask 7 expects the position gap margin at the time of the lamination of two substrates, and is designed small.

[0006] Moreover, the light filter 8 has a common pigment-content powder type resist type, and makes the photosensitive acrylic the base material, the thickness is separated for every color of red copper rust by about 1.5 micrometers, and the joint is located in the black mask 7 section.

[0007] Furthermore, as for the physical relationship of the opening pattern of the black mask 7, and the pattern of a light filter 8, lap length A of the black mask 7 and a light filter 8 is prepared on the design so that the non-colored portion of a light filter 8 may not be located in opening of the black mask 7 in consideration of patterning precision at the time of manufacture of a light filter, even when the worst. On a design, lap length A of this black mask 7 and a light filter 8 becomes the same [a pixel] from the above-mentioned reason at four sides, when a light filter 8 is a dot pattern, and when a light filter 8 is a stripe pattern, in two sides of the cross direction of a stripe, it is the same.

[0008] The range predetermined by offset printing is made to apply, heat and harden the orientation film 13 made from the polyimide etc. on the film surface of ****** and the light filter 8 which explain the manufacture method of a common liquid crystal panel briefly here, the black mask 7, the opposite substrate 10 equipped with the common electrode 9 formed by transparent electric conduction thin films, such as ITO, and the array substrate 6 equipped with the switching element 1 and the pixel electrode 2 grade. Next, after grinding in the fixed direction and carrying out rubbing processing with rubbing cloths, such as rayon, the sealant of an epoxy system is applied to the circumference of one substrate, the spherical particle spacer 11 with a diameter of several microns which uses a resin or a silica as a raw material is sprinkled in the density of about 200 per 1 square millimeter, a film surface is carried out inside, and two aforementioned substrates are stuck on a position in the precision of several microns. Then, it heats in the state where it pressurized, the aforementioned sealant is stiffened, a cell is formed, liquid crystal 12 is poured in by the vacuum pouring-in method from the liquid crystal inlet further prepared in a part of sealant, it closes by ultraviolet-rays hardening resin, the polarizing plate 14 which set up the polarization shaft in the predetermined direction is stuck on the outside of two substrates, and a liquid crystal panel is formed.

[0009]

[Problem(s) to be Solved by the Invention] However, by the above-mentioned conventional design

method, the relation of the irregularity of a light filter 8 and the irregularity of the switching element 1 or the pixel electrode 2 which are formed in the inside of the opposite substrate 10, the electric supply wiring 4, or a storage capacitance 3 was not taken into consideration.

[0010] Therefore, a spacer 11 becomes [the area of the portion to which the portion between two substrates to support, i.e., two substrates intervals, becomes the narrowest] small in many cases. In case a sealant is stiffened and a cell is formed, pressurizing lamination and two substrates through a spacer 11 Since an intensive load joins the spacer of the decimal which exists in the portion supporting between the aforementioned substrates, destroy and a switching element 1 and the layer insulation film 5 are made to short-circuit, or gap ** is not stabilized with dispersion on manufacture but liquid crystal 12 thickness varies, There were big problems -- the display performance of a panel is not stabilized.

[0011] In addition, the distribution density of a spacer needs to lessen as much as possible in order for an optical omission to arise in the spacer section and to degrade quality of image, and it is unsuitable. [of making / many / density for a spacer and solving the above-mentioned technical problem]

[0012] Moreover, explanatory drawing showing the relation between the direction of rubbing of the common liquid crystal panel to drawing 8 and the direction of orientation of a liquid crystal molecule is shown. If the pre tilt angle of the liquid crystal molecule 15 close to the partial B front face which grinds at the time of rubbing of the electric supply wiring 4 grade used as the convex configuration on the array substrate 6, and serves as lowering is low and the level difference section of a light filter 8 is located in the opposite side of this portion, liquid crystal molecule 15 direction will tend to be in disorder, and a reverse tilt domain and a reverse twist domain will produce it in many cases.

[0013] The section occurred if this reverse-chill TODOIMEN and a reverse twist domain are generated, keep shining on a boundary with a normal domain, and when this portion was located in opening of the black mask 7, there was a problem of spoiling display grace greatly.

[0014] this invention solves such a problem and it aims at obtaining the liquid crystal panel by which quality was stabilized.

[0015]

[Means for Solving the Problem] In order to attain this purpose, the electrochromatic display display panel of this invention has the composition from which the length of the lap section of a light filter and a black mask differs by either the upper and lower sides or the longitudinal direction at least for every

pixel.

[0016]

[Function] Without a spacer's being able to enlarge area of the portion to which the portion supporting between two substrates, i.e., two substrates intervals, becomes the narrowest, and destroying a switching element and a layer insulation film by this composition, liquid crystal thickness is fixed and can manufacture the liquid crystal panel by which quality was stabilized.

[0017] Moreover, generating of the reverse tilt domain in the grinding lowering section at the time of rubbing of array substrate top heights or a reverse twist domain can be prevented, and the liquid crystal panel which was excellent in display grace without an optical omission can be manufactured.

[0018]

[Example] Hereafter, the example of this invention is explained, referring to a drawing.

[0019] Drawing 1 is drawing showing some plans of the liquid crystal panel of the 1st example. In this example, the pixel equivalent to red copper rust is the active-matrix type electrochromatic display panel which is a delta array, and the dot-like light filter 8 is formed for the flat-surface configuration in opposite substrate 10 inside.

[0020] It is formed above each pixel so that the storage capacitance 3 connected to the pixel electrode 2 may cover in the upper layer of gate wiring 4b of the preceding paragraph. The ITO film and gate wiring 4b whose pixel electrode 2 is a transparent electric conduction film are formed with Cr film, a storage capacitance 3 is formed with aluminum film, and thickness is 1500A, 1000A, and 4000A, respectively. In addition, between a storage capacitance 3 and gate wiring 4b, the two-layer layer insulation film 5 of SiO2 and SiNx is formed.

[0021] Furthermore, the cross section of the direction of Y-Y in drawing 1 is shown in drawing 2 . The portion which is the highest on the array substrate 8 is the storage-capacitance 3 section, and on the other hand, on the opposite substrate 10, it has designed greatly lap length A of the black mask 7 of this portion, and a light filter 8 in the possible range so that a light filter 8 may be located in the portion to which the portion in which a light filter 8 is located counters the storage-capacitance 3 section by being a convex configuration.

[0022] The width of face of the black mask 7 of this portion was 65 micrometers, and 5 micrometers of the doubling margin of the black mask 7 and a light filter 8 and 10 micrometers of the doubling margin of the ****** light filter 8 were secured, and set to 50 micrometers the design value of lap length A of the black mask 7 of a portion, and a light filter 8 which counters the storage-capacitance 3 section.

[0023] Therefore, the design value of lap length A of the black mask 7 of this portion and a light filter 8 has different composition from a lap length of 5 micrometers of other portions.

[0024] Liquid crystal 12 thickness is fixed, without being able to enlarge area of the portion to which two substrates intervals also become the narrowest by this composition, and the number of the spacers which support between two substrates as a result increasing, and inducing destruction of the switching element 1 by the intensive load to some spacers 11, or the layer insulation film 5, and the liquid crystal panel by which quality was stabilized can be manufactured.

[0025] In addition, when the area of the highest portion of an array substrate is very narrow, the same effect is acquired even if it designs so that a light filter may be located in the opposite side of a portion high to the 2nd.

[0026] Next, it explains, referring to a drawing about the 2nd example. Drawing 3 is drawing showing some plans of the liquid crystal display panel of the 2nd example. In this example, it is the highly minute active-matrix type electrochromatic display panel any pixel of whose equivalent to red copper rust is the stripe array located in screen lengthwise in the shape of a straight line, and the light filter 8 of the shape of a stripe which between the pixels of the vertical direction is following [the flat-surface configuration] is formed in opposite substrate 10 inside.

[0027] There is no problem to which destruction of the element the area of the portion as for which is located since between pixels is following [the light filter 8] the opposite side of this portion in the vertical direction, although a storage capacitance 3 is formed like the 1st example above each pixel and it is the highest on the array substrate 6, and two substrates intervals become the narrowest is large, and according to the intensive load to some spacers 11, and liquid crystal thickness become unstable.

[0028] The cross section of the direction of X-X in drawing 3 is shown in drawing 4 . The liquid crystal panel of this example is highly minute, and it makes line breadth of the black mask 7 the minimum after taking a manufacture margin into consideration in order to secure a luminosity. For this reason, the level difference of the light filter 8 of the portion to which it grinds at the time of rubbing of the heights by source wiring 4a on the array substrate 6, and becomes lowering, and the pre tilt angle of the liquid crystal molecule 15 is small, and the opposite substrate 10 becomes easy to approach.

[0029] Then, by enlarging lap length A of the black mask of this portion, and a light filter as much as possible in this example While making a reverse tilt domain and a

reverse twist domain hard to detach the relative position of the level difference of the light filter 8 of the portion to which it grinds at the time of rubbing, and becomes lowering, and the pre tilt angle of the liquid crystal molecule 15 is small, and the opposite substrate 10, and to produce Even if a reverse tilt domain and a reverse twist domain are generated, it is made for a boundary with a normal domain not to be located in opening of the black mask 7.

[0030] Here, the line breadth of source wiring 4a is 8 micrometers, and the portion to which the portion which the heights of the array substrate 6 grind the line breadth of the black mask 7 about lap length [of 30 micrometers, the black mask 7, and a light filter 8] A, and counters raising counters grinding lowering of the heights of 5 micrometers and the array substrate 6 is considered as the 15-micrometer design.

[0031] Moreover, source wiring 4a is formed by aluminum film, the thickness is 4000A, and 1.6 micrometers and the black mask 7 are formed for thickness by Cr film by three colors of red copper rust being the same, and making acrylic resin into a base material, as for the base material and thickness of a light filter 8, and the thickness is 1000A.

[0032] Next, it explains, referring to a drawing about the 3rd example. Drawing 5 is drawing showing some cross sections of the liquid crystal display panel of the 3rd example. Although the pixel of this example shown in the 2nd example is almost equivalent to the composition of the highly minute active-matrix type electrochromatic display panel which is a stripe array, the case where the inorganic insulator layer 16 is formed in the bottom of the orientation film 13 of the array substrate 6 is shown.

[0033] While this inorganic insulator layer 16 prevents the short-circuit by the electric supply wiring 4 on the common electrode 9 of the opposite substrate 10, and the array substrate 6, the foreign matter with switching element 1 grade, etc., it is prepared in order to prevent accumulation of about one-switching element DC charge, and it is formed by the SiNx film, and the thickness is 4000A. In addition, for driver voltage reduction of liquid crystal 12, this inorganic insulator layer 16 has removed the pixel electrode 2 top, as shown in drawing 5 .

[0034] In the film composition of the array substrate 6 of this example, the part which grinds against the portion from which not only the source wiring 4a section but the inorganic insulator layer 16 is removed at the time of rubbing, and becomes lowering is generated. Since the level difference of this portion is also large, it is easy to produce a reverse tilt domain and a reverse twist domain, and moreover, since distance with opening of the black mask 7 is also very near, a boundary with a normal domain locates

and shines to opening, and tends to serve as an omission.

[0035] However, by using the long thing of lap length A of the black mask of the portion which counters the portion B which grinds as well as the 2nd example as an opposite substrate 10 at the time of rubbing, and serves as lowering, and a light filter, since the irregularity of an opposite substrate is not located in near, it does not generate but a reverse tilt domain and a reverse twist domain can obtain the liquid crystal panel which was excellent in display grace without an optical omission.

[0036] In addition, this invention is effective, especially when patterning of the light filter is carried out with photographs, such as the pigment-content powder resist method, and the edge of the irregularity of the cross-section configuration of a light filter has clarified.

[0037] The content of this invention will become effective and indispensable, if highly-minute-izing of a liquid crystal panel and highly precise-ization of the manufacturing technology of a light filter and a panel will progress further from now on.

[0038]

[Effect of the Invention] As mentioned above, when the length of the lap section of a light filter and a black mask is considering as composition which is different by either the upper and lower sides or the longitudinal direction at least, this invention Without destroying a switching element and a layer insulation film, liquid crystal thickness is fixed and can manufacture the liquid crystal panel by which quality was stabilized. Moreover, generating of the reverse tilt domain in the grinding lowering section at the time of rubbing of array substrate top heights or a reverse twist domain can be prevented, and the liquid crystal panel which was excellent in display grace without an optical omission can be manufactured.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The plan of the important section of the liquid crystal panel by the 1st example of this invention

[Drawing 2] The cross section of this liquid crystal panel

[Drawing 3] The plan of the important section of the liquid crystal panel by the 2nd example of this invention

[Drawing 4] The cross section of this liquid crystal panel

[Drawing 5] The cross section of the liquid crystal panel by the 3rd example of this invention

[Drawing 6] The cross section of a common liquid crystal panel

[Drawing 7] The plan of the important section of a common liquid crystal panel

[Drawing 8] Explanatory drawing

showing the relation between the direction of rubbing in a common liquid crystal panel, and the direction of orientation of a liquid crystal molecule

[Description of Notations]

1 Switching Element
2 Pixel Electrode
3 Storage Capacitance
4 Electric Supply Wiring
4a Source wiring
4b Gate wiring
5 Layer Insulation Film
6 Array Substrate
7 Black Mask
8 Light Filter
9 Common Electrode
10 Opposite Substrate
11 Spacer
12 Liquid Crystal
13 Orientation Film
14 Polarizing Plate
15 Liquid Crystal Molecule
16 Inorganic Insulator Layer

CLAIMS

[Claim(s)]

[Claim 1] the scanning line and/or the signal line which correspond to one [at least] upper part of this scanning line and a signal line in the active-matrix substrate by which the picture element electrode was prepared in the portion which the scanning line and a signal line cross, are wired, and is lined [this scanning line and] off -- inserting -- one side of the picture element electrode of two ****** -- electric -- connecting -- and -- this -- the active-matrix substrate in which the part was superimposed on each of two picture element electrodes, and the shield film was prepared

[Claim 2] The active-matrix substrate according to claim 1 to which the voltage from which polarity differs in the picture element electrode of two ****** on both sides of the aforementioned scanning line or a signal line is impressed.

[Claim 3] The active-matrix substrate according to claim 1 which the aforementioned shield film becomes from the metal which has shading nature.

[Claim 4] The superposition width of face of the two aforementioned picture element electrodes to the aforementioned shield film is an active-matrix substrate according to claim 1 which makes [both] smaller than the value by the side of the picture element electrode of another side the value by the side of the picture element electrode which connected this shield film, and has been set to 0.5 micrometers or more and 5 micrometers or less

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the active-matrix substrate used since a liquid crystal display etc. is constituted.

[0002]

[Description of the Prior Art] As the above-mentioned active-matrix substrate, the thing of the structure shown in drawing 8 and drawing 9 (cross section by the D-D'line of drawing 8) is known conventionally. The gate bus line 501 and the source bus line 502 crossed, and were wired, the picture element electrode 504 was arranged in the field surrounded by both the bus lines 501 and 502, and this substrate is further equipped with TFT (it calls for short Following TFT) 503 as a switching element.

[0003] On-off control of this TFT503 is carried out by the gate bus line 501. The source electrode (not shown) prepared in the end side of TFT503 is connected to the source bus line 502 through a contact hole 505, and a video signal is supplied through the source bus line 502. The drain electrode (not shown) prepared in

the other end side of TFT503 is connected with the picture element electrode 504 through the contact hole 506.

[0004] The above-mentioned source electrode and a drain electrode are formed in the predetermined portion of the Si film 12 prepared on the substrate 11 as shown in drawing 9 , and a semiconductor layer is elsewhere formed in this Si film 12. On this Si film 12, the gate insulator layer 13 of TFT, Si layer which constitutes the gate bus line 501, the layer insulation film 16, metal membranes (not shown), such as aluminum used as the source bus line 502, and the ITO film used as the picture element electrode 504 are formed one by one. The picture element electrode 504 and the Si film 12 are connected through the contact hole 506 which penetrates the gate insulator layer 13 and the layer insulation film 16.

[0005] The liquid crystal display which used such an active-matrix substrate takes the basic structure in which the counterelectrode 509 which carries out opposite arrangement of the transparent opposite substrate 512 on both sides of liquid crystal 513 in between as shown in drawing 10 , and becomes the liquid crystal side front face of the opposite substrate 512 from transparent conductivity thin films, such as ITO, was formed. In addition, drawing 10 shows the cross-section portion by the E-E'line of drawing 8 .

[0006] By the way, when TFT503 is an ON state with the potential given to the gate bus line 501, the video signal sent from the source bus line 502 is supplied to the picture element electrode 504 through a contact hole 506. On the contrary, when TFT503 is an OFF state, this video signal is held with the capacity constituted between the picture element electrode 504 and the aforementioned counterelectrode 509. In addition, between the above-mentioned opposite substrate 512 and the counterelectrode 509, the shading film 510 and insulator layer 511 for interrupting the light penetrated from the portion to which the electric field according to the video signal are not impressed are formed.

[0007]

[Problem(s) to be Solved by the Invention] However, in the conventional active-matrix substrate, as mentioned above, there is only the layer insulation film 16 on the gate bus line 501 and the source bus line 502, and in the liquid crystal 513 on it, the electric field according to the potential impressed to bus lines 501 and 502 will arise. For this reason, it originates in the potential difference between the picture element electrode 504 and the gate bus line 501 or between the picture element electrode 504 and the source bus line 502, and the following problems are invited by the periphery of the picture element electrode 504.

[0008] That is, if potential of a counterelectrode 509 is set to 0V and 5V and about [-5V] voltage are respectively impressed to the picture element electrodes 504 and 504 of two ****** according to a video signal, based on the electric field produced by this, liquid crystal 513 will carry out orientation, the permeability of light will be controlled, and it will function as display. Moreover, about [-10V] voltage is applied to the gate bus line 501 that TFT503 should be turned an OFF state in the maintenance state of a video signal, and the video signal which polarity reverses is added to the source bus line 502.

[0009] therefore -- for example, the electric field on two picture element electrodes 504 which sandwiched the gate bus line 501, and 504 were disturbed by the electric-field component of the longitudinal direction from the gate bus line 501, as shown in drawing 10 , as an arrow showed the field 514 of the liquid crystal which is above the gate bus line 501, the orientation of liquid crystal 513 was confused, and it was, without the ability performing a good display This disorder is similarly produced in all the fields in alignment with the source bus line 502 for sending the video signal which polarity reverses in all the fields not only in alignment with the above-mentioned field 514 but the gate bus line 501.

[0010] Moreover, although it is necessary to make the shading film 510 large in order to interrupt the leakage light produced from the above-mentioned field 514 grade consequently, the fields which do not contribute to a display increase in number. In order to indicate by high-density especially, when size of each picture element electrode 504 is made small, there is another problem that the numerical aperture of the portion which is not covered by the shading film 510 falls remarkably.

[0011] It is possible to solve the technical problem of such conventional technology, to lessen the generating part [liquid crystal / by the signal with which the scanning line and a signal line are sent] of orientation disorder, and to consider as a good display, and this invention aims at offering the active-matrix substrate which can enlarge the numerical aperture of a shading film.

[0012]

[Means for Solving the Problem] In the active-matrix substrate by which the picture element electrode was prepared in the portion which the scanning line and a signal line cross, and the active-matrix substrate of this invention is wired, and is lined [this scanning line and] off On both sides of the scanning line and/or the signal line applicable to one [at least] upper part of this scanning line and a signal line, it connects with one side of the picture element electrode of two ****** electrically. and -- this -- a

part is superimposed on each of two picture element electrodes, the shield film is prepared, and that can attain the above-mentioned purpose

[0013] Moreover, the voltage from which polarity differs in the picture element electrode of two ****** on both sides of the aforementioned scanning line or a signal line may be made to be impressed.

[0014] Moreover, you may make it the aforementioned shield film consist of a metal which has shading nature.

[0015] Moreover, the superposition width of face of the two aforementioned picture element electrodes to the aforementioned shield film makes [both] smaller than the value by the side of the picture element electrode of another side the value by the side of the picture element electrode which connected this shield film, and is good also as 0.5 micrometers or more and 5 micrometers or less.

[0016]

[Function] Since the picture element electrode and shield film serve as this potential by connection even if liquid crystal is arranged on the picture element electrode which it connected with the shield film since the shield film prepared in one [at least] upper part of the scanning line and a signal line connected with one side of the picture element electrode of two ****** on both sides of the corresponding scanning line and/or the signal line and was superimposed, if it is in this invention, it can prevent that disorder arises in the orientation of liquid crystal. moreover, some shield films -- this -- since another side of two picture element electrodes is superimposed, even if liquid crystal is arranged on the picture element electrode of another side which is not this potential and disorder arises into the liquid crystal portion -- it -- a shield film -- a wrap -- things are made

[0017]

[Example] Hereafter, the example of this invention is explained.

[0018] Drawing 1 is the plan showing the active-matrix substrate of this example, and the cross section according [drawing 2] to the A-A'line of drawing 1 and drawing 3 are the cross sections by the B-B'line of drawing 1 . The gate bus line 101 as the scanning line by which this substrate was wired by the longitudinal direction, The source bus line 102 which this gate bus line 101 was intersected and was wired by lengthwise, The picture element electrode 104 prepared in the field surrounded by both the bus lines 101 and 102, An end side is connected to the aforementioned source bus line 102, and it has the composition of having the shield film 108 in which an other end side is shown by TFT103 linked to the picture element electrode 104, and hatching established above the gate bus line 101.

[0019] The above TFT 103 is a switching element which supplies the video signal sent from the source bus line 102 to the

picture element electrode 104, and control of the switching operation is performed by the signal by which the gate bus line 101 is sent. Si thin film 12 portion which has the drain electrode of TFT103 in part is connected to the shield film 108 through a contact hole 106 (refer to drawing 2), and the shield film 108 is connected to the picture element electrode 104 through another contact hole 107 (refer to drawing 3).

[0020] Next, the detailed composition of this active-matrix substrate is explained according to a production procedure based on drawing 2 and drawing 3 . First, patterning of the Si thin film 12 used as the semiconductor layer of TFT103 is formed and carried out on the transparent insulation substrate 11.

[0021] Then, the gate insulator layer 13 and the doped Si film used as a gate electrode are formed on a substrate 11 at this order, and patterning of the upper doped Si film is carried out. Then, after doping with ion-implantation and forming the source of TFT, and a drain electrode, the layer insulation film 14 is formed further. Subsequently, opening of the contact hole 106 which penetrates insulator layers 13 and 14 is carried out.

[0022] Then, patterning of the metal membrane used as the source bus line 102 and the shield film 108 is formed and carried out. two picture element electrodes 104 (the picture element electrode of explanation which exists in the center of drawing 1 for convenience is called 104'.) which exist up and down on both sides of the gate bus line 101 while forming the shield film 108 in this example above the gate bus line 101 -- respectively -- ** -- it has formed so that a part may be superimposed Moreover, thickness was made into 4000A, using aluminum as a material of a metal membrane.

[0023] Subsequently, after forming the insulator layer 15 on the shield film 108 and forming the contact hole 107 which pierces through this after that, patterning of the ITO film used as the picture element electrode 104 was formed and carried out. As this result, it connects with picture element electrode 104' through a contact hole 107, and the shield film 108 serves as this potential. In addition, superposition width of face W1 of the picture element electrode 104' and the shield film 108 used as this potential of this was made smaller than the superposition width of face W2 of the picture element electrode 104 of another side, and the shield film 108, and set both superposition width of face W1 and W2 to 5 micrometers or less by 0.5 micrometers or more.

[0024] Drawing 4 is the cross section showing the liquid crystal display which used the active-matrix substrate produced as mentioned above. In addition, drawing 4 shows the cross-section portion by the C-C'line of drawing 1 . This liquid

crystal display has structure which carried out opposite arrangement of the opposite substrate 112 on both sides of liquid crystal 113 between the active-matrix substrates of this example. The shading film 110 for interrupting the light which carries out incidence to the channel of the light penetrated from the portion in which the electric field according to the video signal are not impressed to the liquid crystal 113 side front face of the opposite substrate 112, and TFT, and an insulator layer 111 are formed in this order. Furthermore, the counterelectrode 109 which consists of transparent conductivity thin films, such as ITO, is formed on it.

[0025] Therefore, in the liquid crystal display of such structure, as mentioned above, the active-matrix substrate of this example has the shield film 108, and this shield film 108 is made on both sides of the gate bus line 101 with one picture element electrode 104' and this potential of the picture element electrode 104 of two ******, and 104'. For this reason, on the picture element electrode 104, although the orientation disorder by longitudinal direction electric field takes place, in the periphery of picture element electrode 104', lateral electric field are hardly produced. Therefore, the orientation disorder of liquid crystal 113 serves as only one side from the conventional both sides, and the field which contributes to a display increases.

[0026] In the active-matrix substrate of this example, since aluminum which has shading nature into the material of the above-mentioned shield film 108 is used, the effect of the improvement in a numerical aperture goes up further by this. Moreover, the effect of the improvement in a numerical aperture is acquired also according to the superposition precision of the picture element electrode 104 by the side of an active-matrix substrate and the shield film 108 being higher than superposition precision with the opposite substrate 112.

[0027] In addition, superposition width of face of a picture element electrode and a shield film was set to 5 micrometers or less by 0.5 micrometers or more because 0.5 micrometers or more were desirable, and 5 micrometers or less were more desirable than the superposition precision at the time of production in order to secure a numerical aperture.

[0028] Moreover, superimposing on the shield film 108 and making superposition width of face W1 by the side of the picture element electrode of the shield film 108 and this potential smaller than the superposition width of face W2 by the side of the picture element electrode of another side between two prepared picture element electrodes depends on the following reason. That is, disorder may not occur in the orientation of liquid crystal, and it is not necessary to cover a display poor portion, and may be small in

the picture element electrode side of this potential. On the contrary, in the picture element electrode side of another side, since disorder arises in the orientation of liquid crystal, it is desirable that it is large enough although it is covered.

[0029] Although formed in the field to which the picture element electrode 104 was surrounded by the gate bus line 101 and the source bus line 102 in the above-mentioned example, the edge of the picture element electrode 104 may be extended to the upper part of the gate bus line 102. That is, it may be made to elongate until it reaches the portion divided with the gate bus line 102, and you may form.

[0030] It is not necessary to make it such, and although the source bus line 102 and the shield film 108 were simultaneously formed using the same material, in the above-mentioned example, it may form separately or another material may be used.

[0031] Drawing 5 is the plan showing other examples of this invention, and drawing 6 is a cross section by F-F' of drawing 5 . In this active-matrix substrate, while replacing with the gate bus line 801 unlike the above-mentioned and forming the shield film 808 (hatching shows) on the source bus line 802, it is considering as the composition which superimposed some shield films 808 on the picture element electrode 804 of two ******, and 804 (the picture element electrode of explanation which is in one rightist inclinations rather than the center of drawing 5 for convenience is called 804'.) each on both sides of this source bus line 802.

[0032] The Si thin film 12 in which the drain electrode of TFT803 was formed in part through the contact hole 806 as this shield film 808 was shown in drawing 6 , It connects with picture element electrode 804' through another contact hole 807. moreover, the superposition width of face with this picture element electrode 804' It is made smaller than the superposition width of face of the picture element electrode 804 and the shield film 808 which exist in the center of drawing 5 , and both superposition width of face is set to 5 micrometers or less by 0.5 micrometers or more like both fronts. Moreover, the shield film 808 was formed on the insulator layer 16 formed on the source bus line 802, and has shielded the source bus line 802. In this example, the alloy of Ti and W was used for the material of the shield film 808, and thickness could be 2000A. Furthermore, the ITO film used as an insulator layer 17 and the picture element electrode 804 is formed on this substrate 11 at this order.

[0033] Drawing 7 is the cross section showing the liquid crystal display formed using this active-matrix substrate, and shows the cross-section portion by the G-G'line of drawing 5 . also in this case -- front -- the same -- alike -- a shield -- a

film -- 808 -- the source -- a bus line -- 802 -- having inserted -- two -- a ** -- a picture element -- an electrode -- 804 -- 804 -- ' -- one side -- a picture element -- an electrode -- 804 -- ' -- said -- potential -- making -- **** . For this reason, on the picture element electrode 804, although the orientation disorder by longitudinal direction electric field takes place, in the periphery of picture element electrode 804', lateral electric field are hardly produced. Therefore, the orientation disorder of liquid crystal 813 serves as only one side from the conventional both sides, and the field which contributes to a display increases. In addition, also in this example, the shield film 808 is formed using the alloy of Ti and W which has shading nature, and a numerical aperture improves further.

[0034] In addition, although the alloy of aluminum, Ti, and W was used for the shield films 108 and 808 in two examples mentioned above, as for the material of a shield film, it is needless to say that the resin which is not necessarily restricted to these and has other metals and conductivity may be used.

[0035] Moreover, although the shield film is prepared on [one] the gate bus line and the source bus line in two examples mentioned above, you may make it this invention prepare a shield film similarly on both not only this but a gate bus line, and a source bus line.

[0036] Furthermore, although TFT is used as a switching element in two examples mentioned above, this invention is applicable also to the active-matrix substrate which uses the switching element of other types.

[0037]

[Effect of the Invention] The part which the orientation disorder of the liquid crystal by the signal with which the scanning line and a signal line are sent generates when being based on this invention, as explained in full detail above can be lessened, and a good display is attained by this, and the numerical aperture of a shading film can be raised, and even if it miniaturizes the size of a picture element electrode to perform especially a high-density display, it is effective in the ability to improve a numerical aperture.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the plan showing the active-matrix substrate of this example.

[Drawing 2] It is a cross section by the A-A'line of drawing 1 .

[Drawing 3] It is a cross section by the B-B'line of drawing 1 .

[Drawing 4] It is the cross section showing the liquid crystal display formed using the active-matrix substrate of drawing 1 , and the cross-section portion by the C-C'line of drawing 1 is shown.

[Drawing 5] It is the plan showing the

active-matrix substrate of other examples.

[Drawing 6] It is a cross section by the F-F'line of drawing 5 .

[Drawing 7] It is the cross section showing the liquid crystal display formed using the active-matrix substrate of drawing 5 , and the cross-section portion by the G-G'line of drawing 5 is shown.

[Drawing 8] It is the plan showing the conventional active-matrix substrate.

[Drawing 9] It is a cross section by the D-D'line of drawing 8 .

[Drawing 10] It is the cross section showing the liquid crystal display formed using the active-matrix substrate of drawing 8 , and the cross-section portion by the E-E'line of drawing 8 is shown.

[Description of Notations]

11 Substrate
12 Si Thin Film
13 Gate Insulator Layer
14 Layer Insulation Film
15 Insulator Layer
16 Insulator Layer
17 Insulator Layer
101 801 Gate bus line
102 802 Source bus line
103 803 TFT
104 804 Picture element electrode
104', 804' Picture element electrode
105 805 Contact hole
106 806 Contact hole
107 807 Contact hole
108 808 Shield film
109 809 Counterelectrode
110 810 Shading film
111 811 Insulator layer
112 812 Opposite substrate
113 813 Liquid crystal

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平5－27249

(43)公開日　平成５年(1993)２月５日

(51)Int.Cl.[5]		識別記号	庁内整理番号	Ｆ Ｉ	技術表示箇所
Ｇ０２Ｆ	1/1343		9018－2K		
	1/133	５５０	7820－2K		
	1/136	５００	9018－2K		
Ｇ０９Ｇ	3/36		7926－5G		
			9056－4M	Ｈ０１Ｌ　29/ 78　３１１　Ａ	

審査請求　未請求　請求項の数４(全　８　頁)　最終頁に続く

(21)出願番号　特願平3－186618

(22)出願日　平成３年(1991)７月25日

(71)出願人　000005049
シャープ株式会社
大阪府大阪市阿倍野区長池町22番22号

(72)発明者　島田　尚幸
大阪市阿倍野区長池町22番22号　シャープ株式会社内

(72)発明者　市村　幸子
大阪市阿倍野区長池町22番22号　シャープ株式会社内

(72)発明者　吉村　洋二
大阪市阿倍野区長池町22番22号　シャープ株式会社内

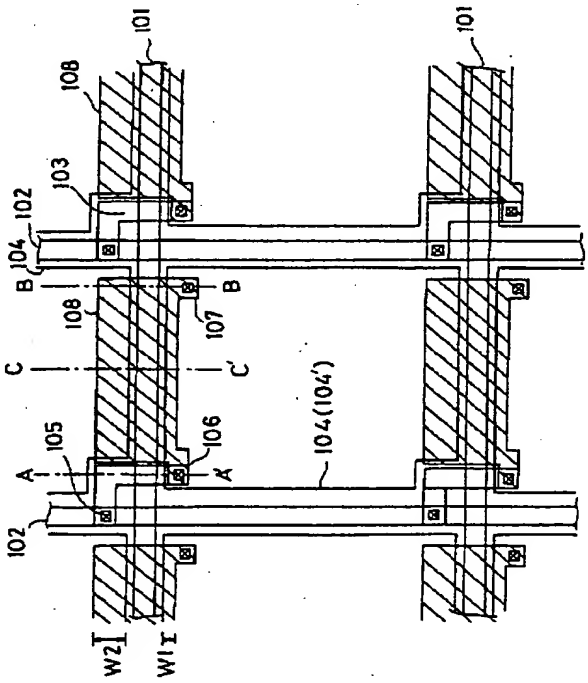
(74)代理人　弁理士　山本　秀策

(54)【発明の名称】　アクテイブマトリクス基板

(57)【要約】

【目的】アクティブマトリクス基板において配線を送られる信号による液晶の乱れの発生を抑制して良好な表示が可能であり、かつ遮光膜の開口率を大きくできるようにする。

【構成】ゲートバスライン１０１の上方に設けられたシールド膜１０８が、そのゲートバスライン１０１を挟んで隣合う２つの絵素電極１０４、１０４´の一方の絵素電極１０４´と接続し、かつ重畳してあるので、シールド膜１０８と接続した絵素電極１０４´上に液晶が配設されても、その絵素電極１０４´とシールド膜１０８とが接続により同電位となっているので、その液晶部分に乱れが生じるのを防止できる。また、シールド膜１０８の一部を該２つの絵素電極１０４、１０４´の他方の絵素電極１０４とも重畳しているので、同電位でない他方の絵素電極１０４上に液晶が配設されてその液晶部分に乱れが生じても、それをシールド膜１０８にて覆い隠すことができる。



1

【特許請求の範囲】

【請求項１】走査線及び信号線が交差して配線され、該走査線及び信号線で仕切られる部分に絵素電極が設けられたアクティブマトリクス基板において、

該走査線及び信号線の少なくとも一方の上方に、該当する走査線及び／又は信号線を挟んで隣合う２つの絵素電極の一方と電気的に接続し、かつ該２つの絵素電極それぞれと一部を重畳してシールド膜が設けられたアクティブマトリクス基板。

【請求項２】前記走査線又は信号線を挟んで隣合う２つの絵素電極に極性の異なる電圧が印加される請求項１記載のアクティブマトリクス基板。

【請求項３】前記シールド膜が遮光性を有する金属からなる請求項１記載のアクティブマトリクス基板。

【請求項４】前記シールド膜に対する前記２つの絵素電極の重畳幅は、該シールド膜を接続した絵素電極側の値を他方の絵素電極側の値よりも小さくし、かつ共に０．５μｍ以上、５μｍ以下としてある請求項１記載のアクティブマトリクス基板。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、液晶表示装置などを構成するために使用されるアクティブマトリクス基板に関する。

【０００２】

【従来の技術】上記アクティブマトリクス基板としては、従来、図８及び図９（図８のＤ－Ｄ´線による断面図）に示す構造のものが知られている。この基板は、ゲートバスライン５０１とソースバスライン５０２とが交差して配線され、両バスライン５０１、５０２で包囲された領域に絵素電極５０４が配設され、更にスイッチング素子として薄膜トランジスタ（以下ＴＦＴと略称する）５０３を備えている。

【０００３】このＴＦＴ５０３はゲートバスライン５０１によってオン・オフ制御される。ＴＦＴ５０３の一端側に設けられたソース電極（図示せず）は、コンタクトホール５０５を介してソースバスライン５０２に接続され、ソースバスライン５０２を通じて映像信号が供給される。ＴＦＴ５０３の他端側に設けられたドレイン電極（図示せず）は、コンタクトホール５０６を介して絵素電極５０４と接続されている。

【０００４】上記ソース電極、ドレイン電極は、図９に示すように基板１１上に設けたＳｉ膜１２の所定部分に形成され、このＳｉ膜１２には他に半導体層も形成される。このＳｉ膜１２の上には、ＴＦＴのゲート絶縁膜１３と、ゲートバスライン５０１を構成するＳｉ層と、層間絶縁膜１６と、ソースバスライン５０２となるＡｌ等の金属膜（図示せず）と、絵素電極５０４となるＩＴＯ膜とが順次形成されている。絵素電極５０４とＳｉ膜１２とはゲート絶縁膜１３及び層間絶縁膜１６を貫通するコンタクトホール５０６を介して接続されている。

2

【０００５】このようなアクティブマトリクス基板を使用した液晶表示装置は、図１０に示すように間に液晶５１３を挟んで透明な対向基板５１２を対向配設し、かつ対向基板５１２の液晶側表面にＩＴＯ等の透明導電性薄膜からなる対向電極５０９を形成した基本構造をとる。なお、図１０は図８のＥ－Ｅ´線による断面部分を示す。

【０００６】ところで、ゲートバスライン５０１に与えられる電位によってＴＦＴ５０３がオン状態となっているとき、ソースバスライン５０２より送られる映像信号はコンタクトホール５０６を通じて絵素電極５０４に供給される。逆に、ＴＦＴ５０３がオフ状態のとき、この映像信号は絵素電極５０４と前記対向電極５０９との間で構成される容量によって保持される。なお、上記対向基板５１２と対向電極５０９との間には、映像信号に応じた電界が印加されていない部分より透過する光を遮るための遮光膜５１０及び絶縁膜５１１が形成されている。

【０００７】

【発明が解決しようとする課題】しかしながら、従来のアクティブマトリクス基板においては、上述したようにゲートバスライン５０１、ソースバスライン５０２上には層間絶縁膜１６しかなく、その上にある液晶５１３にはバスライン５０１、５０２に印加される電位に応じた電界が生じることになる。このため、絵素電極５０４とゲートバスライン５０１との間、或は絵素電極５０４とソースバスライン５０２との間の電位差に起因して、絵素電極５０４の周辺部で以下のような問題が招来される。

【０００８】即ち、対向電極５０９の電位を０Ｖとし、隣合う２つの絵素電極５０４、５０４には映像信号に応じて各々５Ｖ、－５Ｖ程度の電圧を印加すると、これによって生じる電界に基づいて液晶５１３が配向して光の透過率が制御され、表示装置として機能する。また、ゲートバスライン５０１には映像信号の保持状態においてはＴＦＴ５０３をオフ状態とすべく－１０Ｖ程度の電圧が加えられ、ソースバスライン５０２には極性の反転する映像信号が加えられている。

【０００９】そのため、例えば図１０に示すようにゲートバスライン５０１を挟んだ２つの絵素電極５０４と５０４上の電界が、ゲートバスライン５０１からの横方向の電界成分によって乱され、ゲートバスライン５０１の上方にある液晶の領域５１４において矢印で示すように液晶５１３の配向が乱れ、良好な表示を行えずにいた。この乱れは、上記領域５１４のみでなく、ゲートバスライン５０１に沿った全領域において、また極性の反転する映像信号を送るためのソースバスライン５０２に沿った全領域において同様に生じる。

【００１０】また、上記領域５１４等から生じる漏れ光

を遮るためには、遮光膜５１０を広くすることが必要となるが、その結果、表示に寄与しない領域が増える。特に、高密度表示をするために個々の絵素電極５０４のサイズを小さくした場合には、遮光膜５１０にて覆われていない部分の開口率が著しく低下するという別の問題がある。

【００１１】本発明は、このような従来技術の課題を解決するものであり、走査線や信号線を送られる信号による液晶の配向乱れの発生箇所を少なくして良好な表示とすることが可能であり、かつ遮光膜の開口率を大きくできるアクティブマトリクス基板を提供することを目的とする。

【００１２】

【課題を解決するための手段】本発明のアクティブマトリクス基板は、走査線及び信号線が交差して配線され、該走査線及び信号線で仕切られる部分に絵素電極が設けられたアクティブマトリクス基板において、該走査線及び信号線の少なくとも一方の上方に、該当する走査線及び／又は信号線を挟んで隣合う２つの絵素電極の一方と電気的に接続し、かつ該２つの絵素電極それぞれと一部を重畳してシールド膜が設けられており、そのことにより上記目的を達成することができる。

【００１３】また、前記走査線又は信号線を挟んで隣合う２つの絵素電極に極性の異なる電圧が印加されるようにしてもよい。

【００１４】また、前記シールド膜が遮光性を有する金属からなるようにしてもよい。

【００１５】また、前記シールド膜に対する前記２つの絵素電極の重畳幅は、該シールド膜を接続した絵素電極側の値を他方の絵素電極側の値よりも小さくし、かつ共に０．５μｍ以上、５μｍ以下としてもよい。

【００１６】

【作用】本発明にあっては、走査線と信号線の少なくとも一方の上方に設けられたシールド膜が、該当する走査線及び／又は信号線を挟んで隣合う２つの絵素電極の一方と接続し、かつ重畳してあるので、シールド膜と接続した絵素電極上に液晶が配設されても、その絵素電極とシールド膜とが接続により同電位となっているので、液晶の配向に乱れが生じるのを防止できる。また、シールド膜の一部を該２つの絵素電極の他方とも重畳しているので、同電位でない他方の絵素電極上に液晶が配設されてその液晶部分に乱れが生じても、それをシールド膜にて覆うことができる。

【００１７】

【実施例】以下、本発明の実施例を説明する。

【００１８】図１は本実施例のアクティブマトリクス基板を示す平面図であり、図２は図１のＡ－Ａ´線による断面図、図３は図１のＢ－Ｂ´線による断面図である。この基板は、横方向に配線された走査線としてのゲートバスライン１０１と、このゲートバスライン１０１と交差して縦方向に配線されたソースバスライン１０２と、両バスライン１０１、１０２にて包囲された領域に設けられた絵素電極１０４と、前記ソースバスライン１０２に一端側を接続し、他端側を絵素電極１０４と接続したＴＦＴ１０３と、ゲートバスライン１０１の上方に設けたハッチングにて示すシールド膜１０８を有する構成となっている。

【００１９】上記ＴＦＴ１０３は、ソースバスライン１０２より送られる映像信号を絵素電極１０４に供給するスイッチング素子であり、そのスイッチング動作の制御はゲートバスライン１０１を送られる信号により行われる。ＴＦＴ１０３のドレイン電極を一部に有するＳｉ薄膜１２部分は、コンタクトホール１０６を通じてシールド膜１０８に接続され（図２参照）、またシールド膜１０８は別のコンタクトホール１０７を通じて絵素電極１０４に接続されている（図３参照）。

【００２０】次に、このアクティブマトリクス基板の詳細な構成を、図２及び図３に基づき作製手順に従って説明する。先ず、透明絶縁性基板１１上にＴＦＴ１０３の半導体層となるＳｉ薄膜１２を形成し、パターニングする。

【００２１】続いて、基板１１上にゲート絶縁膜１３と、ゲート電極となるドープトＳｉ膜とをこの順に形成し、上側のドープトＳｉ膜をパターニングする。その後、イオン注入法によりドーピングを行ってＴＦＴのソース、ドレイン電極を形成した後、更に層間絶縁膜１４を形成する。次いで、絶縁膜１３、１４を貫通するコンタクトホール１０６を開口する。

【００２２】続いて、ソースバスライン１０２及びシールド膜１０８となる金属膜を形成し、パターニングする。本実施例におけるシールド膜１０８は、ゲートバスライン１０１の上方に設けると共に、そのゲートバスライン１０１を挟んで上下に存在する２つの絵素電極１０４（説明の便宜上、図１の中央にある絵素電極を１０４´という。）それぞれと一部重畳するように形成してある。また、金属膜の材料としてはＡｌを用い、厚みは４０００オングストロームとした。

【００２３】次いで、シールド膜１０８上に絶縁膜１５を形成し、その後これを貫くコンタクトホール１０７を形成した後に、絵素電極１０４となるＩＴＯ膜を形成し、パターニングした。この結果として、シールド膜１０８はコンタクトホール１０７を介して絵素電極１０４´と接続され、同電位となっている。なお、この同電位となっている絵素電極１０４´とシールド膜１０８との重畳幅Ｗ１は、他方の絵素電極１０４とシールド膜１０８との重畳幅Ｗ２よりも小さくし、かつ両重畳幅Ｗ１、Ｗ２は０．５μｍ以上で５μｍ以下とした。

【００２４】図４は以上のようにして作製されたアクティブマトリクス基板を使用した液晶表示装置を示す断面図である。なお、図４は図１のＣ－Ｃ´線による断面部

分を示す。この液晶表示装置は、本実施例のアクティブマトリクス基板との間に液晶１１３を挟んで対向基板１１２を対向配設した構造となっており、対向基板１１２の液晶１１３側表面には、映像信号に応じた電界が印加されていない部分より透過する光及びＴＦＴのチャネルに入射する光を遮るための遮光膜１１０、及び絶縁膜１１１がこの順に形成され、更にその上にＩＴＯなどの透明導電性薄膜よりなる対向電極１０９が形成されている。

【００２５】したがって、このような構造の液晶表示装置においては、上述したように本実施例のアクティブマトリクス基板がシールド膜１０８を有し、このシールド膜１０８がゲートバスライン１０１を挟んで隣合う２つの絵素電極１０４、１０４´の一方の絵素電極１０４´と同電位となしてある。このため、絵素電極１０４上では横方向電界による配向乱れが起こるものの絵素電極１０４´の周辺部においては殆ど横方向の電界は生じない。よって、液晶１１３の配向乱れが、従来の両側から片側のみとなり、表示に寄与する領域が増加する。

【００２６】本実施例のアクティブマトリクス基板においては、上記シールド膜１０８の材料に遮光性を有するＡｌを用いているので、これによって開口率向上の効果は一層上がる。また、開口率向上の効果は、対向基板１１２との重ね合わせ精度よりもアクティブマトリクス基板側の絵素電極１０４とシールド膜１０８との重ね合わせ精度の方が高いことによっても得られる。

【００２７】なお、絵素電極とシールド膜との重畳幅を０．５μｍ以上で５μｍ以下としたのは、作製時の重ね合わせ精度より０．５μｍ以上が好ましく、また開口率を確保するためには５μｍ以下が好ましいからである。

【００２８】また、シールド膜１０８と重畳して設けた２つの絵素電極のうち、シールド膜１０８と同電位の絵素電極側での重畳幅Ｗ１を、他方の絵素電極側での重畳幅Ｗ２よりも小さくするのは次の理由に依る。即ち、同電位の絵素電極側では液晶の配向に乱れが発生せず、表示不良部分を覆い隠す必要がなく小さくてもよい。逆に、他方の絵素電極側では液晶の配向に乱れが生じるため、それを覆い隠すのに十分大きいことが好ましい。

【００２９】上記実施例においては絵素電極１０４はゲートバスライン１０１及びソースバスライン１０２で包囲された領域に形成しているが、絵素電極１０４の端部はゲートバスライン１０２の上部まで伸びていてもよい。つまり、ゲートバスライン１０２で仕切られる部分に達するまで伸長させて形成してもよい。

【００３０】上記実施例ではソースバスライン１０２とシールド膜１０８とは同一材料を使用して同時に形成したが、そのようにする必要はなく、別々に形成したり別の材料を用いてもよい。

【００３１】図５は本発明の他の実施例を示す平面図であり、図６は図５のＦ－Ｆ´による断面図である。この

アクティブマトリクス基板においては、前述と異なりゲートバスライン８０１に代えてソースバスライン８０２上にシールド膜８０８（ハッチングで示す）を形成すると共に、このソースバスライン８０２を挟んで隣合う２つの絵素電極８０４、８０４（説明の便宜上、図５の中央よりも１つ右寄りにある絵素電極を８０４´という。）各々とシールド膜８０８の一部を重畳した構成としている。

【００３２】このシールド膜８０８は、図６に示すようにコンタクトホール８０６を通じてＴＦＴ８０３のドレイン電極が一部に形成されたＳｉ薄膜１２と、また別のコンタクトホール８０７を通じて絵素電極８０４´と接続されており、この絵素電極８０４´との重畳幅は、図５の中央にある絵素電極８０４とシールド膜８０８との重畳幅よりも小さくし、かつ、両重畳幅を共に前同様に０．５μｍ以上で５μｍ以下としている。また、シールド膜８０８はソースバスライン８０２上に形成された絶縁膜１６の上に形成され、ソースバスライン８０２をシールドしている。この例ではシールド膜８０８の材料にＴｉとＷの合金を用い、膜厚は２０００オングストロームとした。更に、この基板１１上に絶縁膜１７及び絵素電極８０４となるＩＴＯ膜をこの順に形成している。

【００３３】図７は、かかるアクティブマトリクス基板を用いて形成した液晶表示装置を示す断面図であり、図５のＧ－Ｇ´線による断面部分を示す。この場合にも、前同様にシールド膜８０８がソースバスライン８０２を挟んだ２つの絵素電極８０４、８０４´の一方の絵素電極８０４´と同電位となしてある。このため、絵素電極８０４上では横方向電界による配向乱れが起こるものの絵素電極８０４´の周辺部においては殆ど横方向の電界は生じない。よって、液晶８１３の配向乱れが、従来の両側から片側のみとなり、表示に寄与する領域が増加する。なお、この実施例においてもシールド膜８０８が遮光性を有するＴｉとＷの合金を用いて形成されており、開口率は一層向上する。

【００３４】なお、上述した２つの実施例においてシールド膜１０８、８０８にＡｌ、ＴｉとＷの合金を使用したが、シールド膜の材料はこれらに限られるわけではなく、他の金属や導電性を有する樹脂を用いてもよいことはもちろんである。

【００３５】また、上述した２つの実施例においてはゲートバスラインとソースバスラインの一方の上にシールド膜を設けているが、本発明はこれに限らず、ゲートバスラインとソースバスラインの両方の上にシールド膜を同様にして設けるようにしてもよい。

【００３６】更に、上述した２つの実施例においてはスイッチング素子として薄膜トランジスタを用いているが、本発明は他種類のスイッチング素子を使用するアクティブマトリクス基板に対しても適用できる。

【００３７】

【発明の効果】以上詳述したように本発明による場合には、走査線及び信号線を送られる信号による液晶の配向乱れが発生する箇所を少なくでき、これにより良好な表示が可能となり、また遮光膜の開口率を高めることができ、特に高密度表示を行うべく絵素電極のサイズを小型化しても開口率を向上できるという効果がある。

【図面の簡単な説明】

【図１】本実施例のアクティブマトリクス基板を示す平面図である。

【図２】図１のＡ－Ａ´線による断面図である。

【図３】図１のＢ－Ｂ´線による断面図である。

【図４】図１のアクティブマトリクス基板を用いて形成した液晶表示装置を示す断面図であり、図１のＣ－Ｃ´線による断面部分を示す。

【図５】他の実施例のアクティブマトリクス基板を示す平面図である。

【図６】図５のＦ－Ｆ´線による断面図である。

【図７】図５のアクティブマトリクス基板を用いて形成した液晶表示装置を示す断面図であり、図５のＧ－Ｇ´線による断面部分を示す。

【図８】従来のアクティブマトリクス基板を示す平面図である。

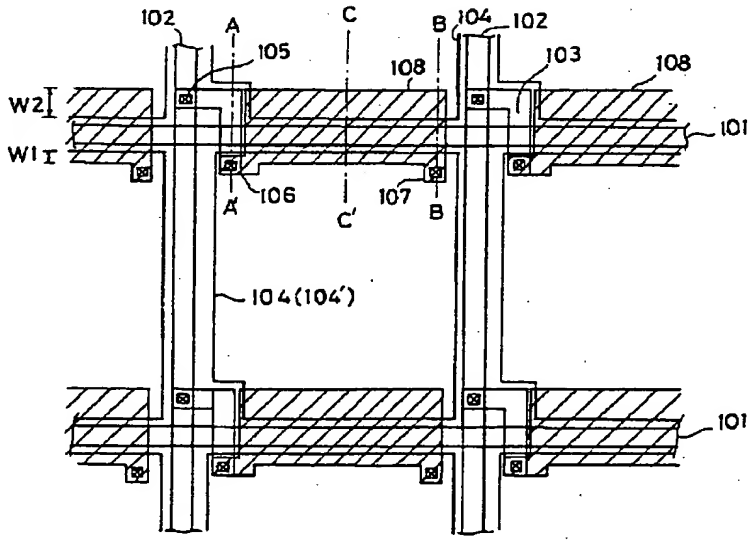
【図９】図８のＤ－Ｄ´線による断面図である。

【図１０】図８のアクティブマトリクス基板を用いて形成した液晶表示装置を示す断面図であり、図８のＥ－Ｅ´線による断面部分を示す。

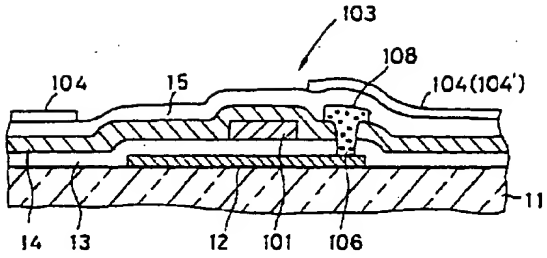
【符号の説明】

１１　基板
１２　Ｓｉ薄膜
１３　ゲート絶縁膜
１４　層間絶縁膜
１５　絶縁膜
１６　絶縁膜
１７　絶縁膜
１０１、８０１　ゲートバスライン
１０２、８０２　ソースバスライン
１０３、８０３　薄膜トランジスタ
１０４、８０４　絵素電極
１０４´、８０４´　絵素電極
１０５、８０５　コンタクトホール
１０６、８０６　コンタクトホール
１０７、８０７　コンタクトホール
１０８、８０８　シールド膜
１０９、８０９　対向電極
１１０、８１０　遮光膜
１１１、８１１　絶縁膜
１１２、８１２　対向基板
１１３、８１３　液晶

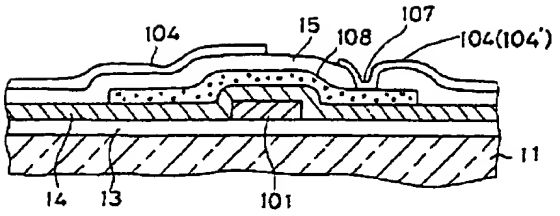
【図１】



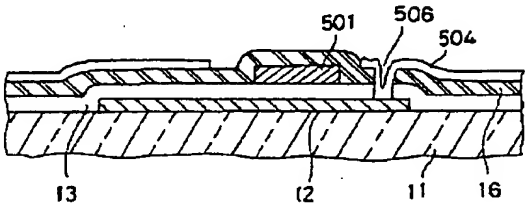
【図２】


103
108
104
15
104(104')
11
14
13
12
101
106

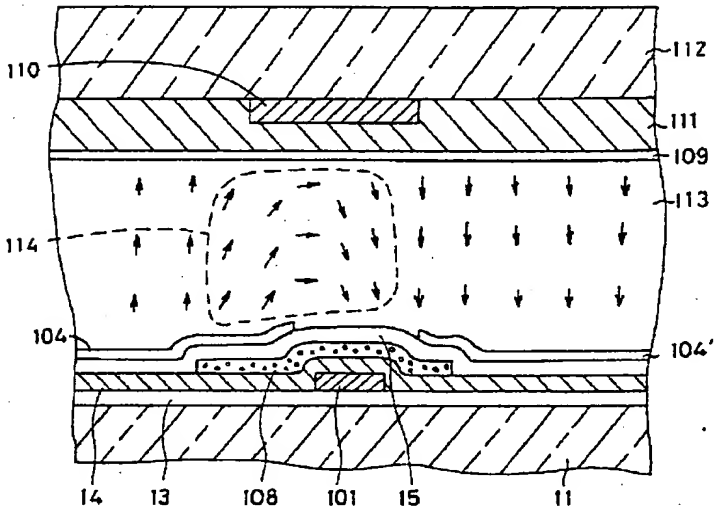
【図３】


104
15
108
107
104(104')
11
14
13
101

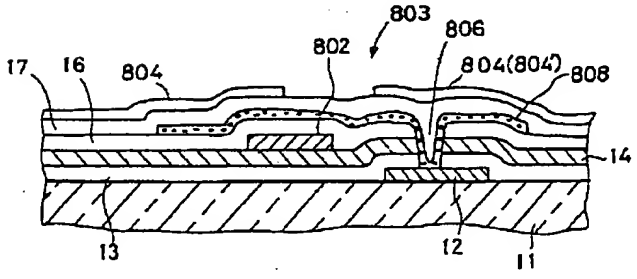
【図９】


501
506
504
13
12
11
16

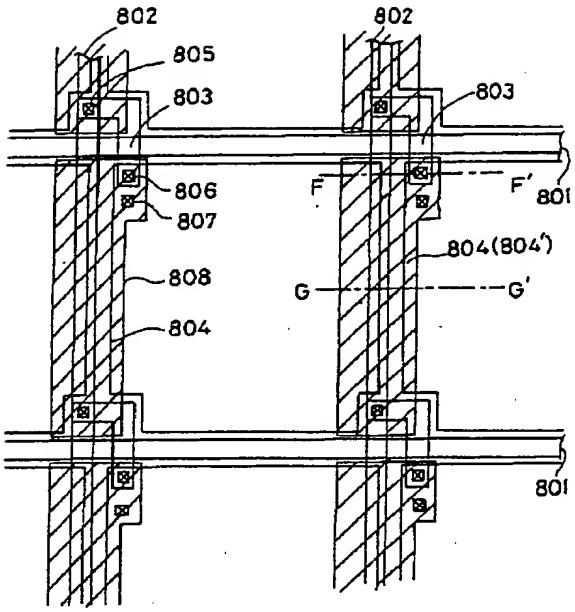
【図４】


110
112
111
109
113
114
104
104'
14
13
108
101
15
11

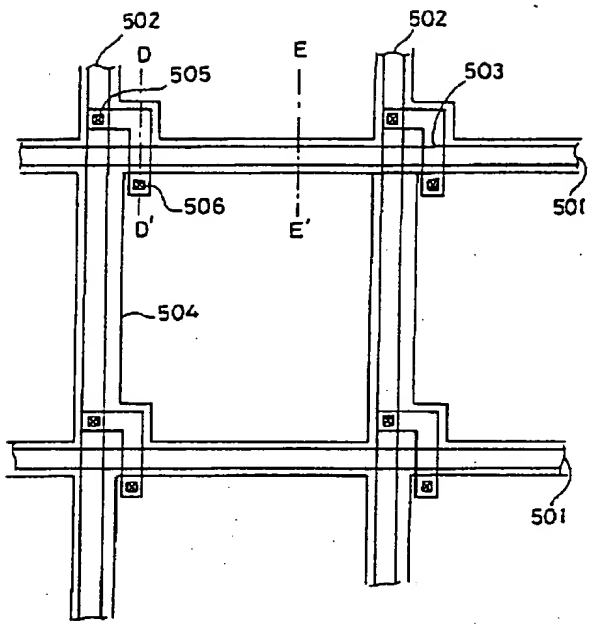
【図６】


803
806
802
804(804')
808
17
16
804
14
13
12
11

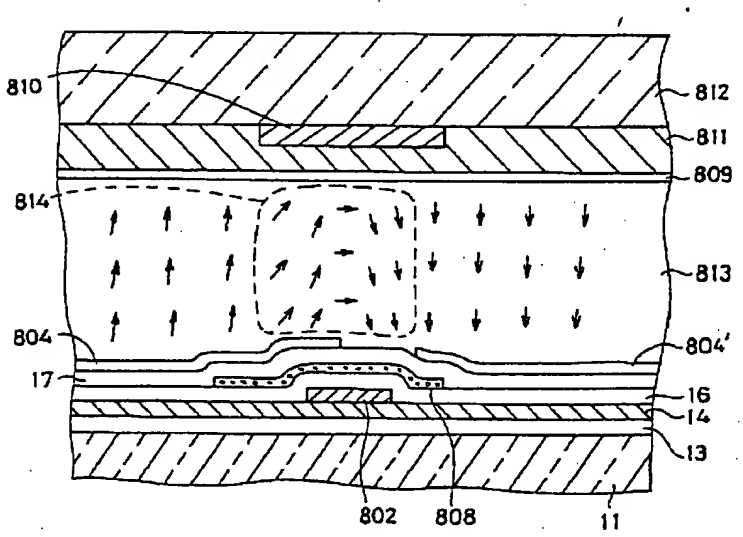
【図５】


802
805
803
806
807
808
804
F
F'
801
802
803
804(804')
G
G'
801

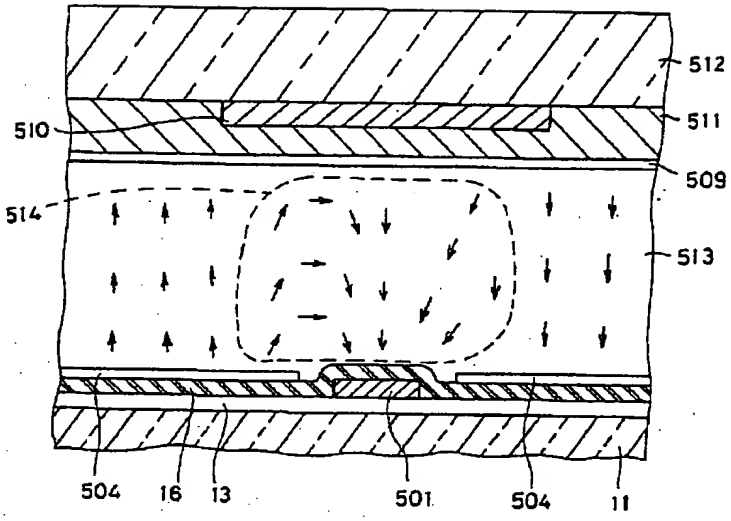
【図８】


502
D
505
E
502
503
506
D'
E'
501
504
501

【図７】


810
812
811
809
814
813
804
804'
17
16
14
13
802
808
11

【図１０】



フロントページの続き

(51) Int. Cl. 5	識別記号	庁内整理番号	Ｆ Ｉ	技術表示箇所
Ｈ０１Ｌ　27/12		Ａ　8728－4M		
29/784				